DCEO Public Sector CHP Pilot Program
&
TRM Update

Presentation at:

IL. EE Stakeholder Advisory Group

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John Cuttica

Energy Resources Center

University of Illinois at Chicago

Illinois Commerce Commission Order

- Approved DCEO Public Sector CHP Program
- Directs the DCEO and the utilities to work with the Stakeholder Advisory Group (SAG) to incorporate a standardized energy savings calculation methodology for CHP into the Illinois Technical Resource Manual (TRM)
- Approved the DCEO calculation methodology for the Pilot Program.

More Information: View pages 32-34 (Section E, 7. Commission Analysis and Conclusion) of the ICC Final Order (CN-13-0499) to DCEO (www.icc.illinois.gov/downloads/public/edocket/367581.pdf).

DCEO Public Sector CHP Pilot Program

- Encourages investment in both
  - Conventional CHP or Topping Cycle CHP
  - Waste Heat-to-Power (WHP) CHP or Bottoming Cycle CHP
- Performance based incentive program
  - Requires performance of 60% (HHV) minimum annual efficiency (estimated at time of application)
  - Requires measured annual efficiency performance over 12 months of operation
  - Production incentive based on useful kWhs produced at specified efficiency levels
  - Must meet the Total Resource Cost (TRC) test

Planned Program Timeline

Date	Activity
June 2014	RFA Released
June through October, 2014	Webinars – How to Apply
October 17th, 2014	Deadline for Project Applications
November, 2014	Project Awards Announced
February/March 2015	DCEO Contracts Awarded
May, 2016	Deadline for Project Commissioning
May, 2017	Deadline for 12 Months of CHP Operation

RFA Review

- Utility Meeting – April, 2014
  - Ameren, ComEd, Nicor, Peoples, MCA
- ADM Review – April, 2014
- NRDC Review – May, 2014
- SAG Meeting – Today, May 27th, 2014
- RFA Expected Release – Early June

Project Eligibility

- Projects must be physically located in Illinois
- Customer site must receive energy delivery service from participating utility.
- Projects must be public sector
- Topping Cycle systems: minimum 60% efficiency (HHV) with at least 20% of total useful energy output in the form of useful thermal energy.
- Bottoming Cycle (WHP) systems no efficiency requirement if no additional fuel required to operate.
- Existing CHP systems are eligible if CHP system has not operated in last 3 years and would require a 2+ year payback (w/o incentives) to repair/upgrade and bring back online
- Existing prime mover systems not presently outfitted with heat recovery (again payback to upgrade > 2 years w/o incentives).

Incentive Structure

Type	Incentive Value[1]	Issue Date
Design Incentive	$75/kW capacity[2]	Completion of the design phase
Construction Incentive	$175/kW capacity[3]	Successful commissioning of the system
Production Incentive (Conventional CHP)	$0.08/kWh ($\eta \geq 70\%$ HHV) OR $0.06/kWh ($60\% \leq \eta < 70\%$ HHV) of "useful electric energy" produced	After 12 months of operation based on meeting the measured operating requirements of the system
Production Incentive (WHP)	$0.08/kWh of "useful electric energy produced" – assumes no additional fossil fuel utilized	After 12 months of operation

1. Total Incentive (Design + Construction + Production) capped at $2M or 50% of project cost, whichever is less
2. Design incentive is capped at $195,000 or 50% of design cost , whichever is less
3. Construction total capped at 50% of construction cost or [$650,000 – design incentive], whichever is less

Measuring & Calculating Annual Energy Efficiency

$$CHP\ Annual\ Eff\ (HHV) = \frac{\left[Useful\ thermal\ \left(\frac{kBtu}{yr}\right) + Useful\ electric\ \left(\frac{kWh}{yr}\right) * 3.412\ \left(\frac{kBtu}{kWh}\right)\right]}{F\ total\ CHP\ \left(\frac{kBtu}{yr}\right)}$$

- *Useful thermal energy output (kBtu/yr):* thermal energy output of the CHP system that is actually recovered and utilized in the facility/process
- *Useful electric output (kWh/yr):* electricity output of the CHP system that is actually used to replace the purchased electricity required to meet the requirements of the facility/process
- *F total CHP (kBtu/yr):* total fuel in consumed by the CHP system

Measuring & Calculating Annual Energy Efficiency

- At the time of application:
  - Estimated efficiency based on feasibility analysis
  - All assumptions clearly identified
  - One line diagrams of meter placement to collect operational data

- At the time of performance incentive payment:
  - Actual efficiency based on metered data
  - Electric kWh meter --- *useful electric output*
  - Natural Gas meter --- *F total CHP – Btus consumed*
  - BTU meter(s) --- *useful thermal energy output*

Energy Savings

- The customer is interested in the incentive levels
  (kWh produced at required annual efficiency levels)
- The program is interested in the energy savings
  (kWh and therm savings realized by the system)
- The same measured data required to calculate the performance (energy efficiency) is needed to calculate the energy savings.

Goal is to push for long hours of operation at highest levels of efficiency to achieve maximum energy savings.

Energy Savings Calculations

- **Fuel Savings** =

  Fuel that would have been utilized to generate the useful electricity output of the CHP system if that electricity was provided from the **Local Electric Grid**

  +

  Fuel that would have been utilized by a **Boiler On-Site** to provide the useful thermal energy output of the CHP system)

  –

  Total Fuel Consumed by the **CHP system**

S fuel CHP = (F grid + F thermal CHP) – F total CHP[1]

1: Fuel & Carbon Dioxide Emissions Savings Calculation Methodology for CHP Systems – US EPA CHP Partnership; August 2012

Energy Savings Calculations (Cont'd)

- F grid = useful electric output of CHP X H grid
  - Useful electric output – metered data
  - H grid is heat rate of the grid – EPA eGrid all fossil with T&D losses
- F thermal CHP = useful thermal energy output of CHP ÷ efficiency of on-site boiler displaced
  - Useful thermal energy output – metered data
- F total CHP is total fuel consumed by CHP system
  - F total CHP – metered data

Allocating the Fuel Savings

- Original split based on budget split 80/20
- Split revised to 75/25 (75% electric – 25% gas)
  - F grid (fuel would have been utilized to generate the useful electric output of CHP system)
  - F thermal CHP (fuel would have been utilized on-site by a boiler to provide the useful thermal energy output of CHP)
  - Ratio the two results (approx. 75/25 for technologies and applications expected in the pilot program)
- Continue to look at other approaches

Converting Btu fuel savings to kWh & therms

- Therms = (25% Btu fuel savings) ÷ 100,000 Btu/therm

- kWh = (75% Btu fuel savings) ÷ H_{eff} CHP (Btus/kWh)
  - H_{eff} CHP = (F total CHP – F thermal CHP) ÷ useful electric output of CHP system

Total Resource Cost (TRC) Test

$$TRC = \frac{NPV \sum Benefits}{NPV \sum Costs}$$

Benefits	Costs
• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution • Additional resources savings (ie: gas and water if utility is electric) • Monetized environmental and non-energy benefits • Applicable Tax credits	• Program overhead costs • Program installation costs • Incremental measure costs (whether paid by customer or utility) • Maintenance costs • Cost of extra fuel used by the CHP system for its operation

TRC Calculator Inputs

Inputs	**Units**		
CHP System Type		Conventional	*Choose Conventional or Waste-Heat-to-Power*
Application Type		Other	*WWTP = Waste Water Treatment Plant* *Other = For all other application types*
-		- -	*Choose one from drop-down*
Choose NA		NA	*Choose one from drop-down*
Technology Type		Recip Engine	*Choose one from drop-down*
Electric Delivery Utility		ComEd	*Choose one from drop-down*
Natural Gas Delivery Utility		Nicor	*Choose one from drop-down*
CHP Capacity	kW	1,121	*Nameplate capacity of the prime-mover. This is the capacity of the engine or turbine*
Operating Hours	Hrs	6,000	*Enter the annual operating hours*
Recoverable Heat from CHP	kBtu/hr	4,320	*Total possible heat recoverable from the CHP system*
- -	- -	-	
- -	- -	-	
Electric Efficiency	%	33%	*Enter the prime mover's electric efficiency*
Heating Value Type		HHV	*Enter the heating value type of the electric efficiency* *HHV = Higher Heating value, LHV = Lower Heating Value*
Thermal Utilization	%	80%	*% of Recoverable heat that is actually recovered and utilized in the facility/process. Applicable for Conventional CHP Systems only*
Displaced thermal Eff	%	75%	*Efficiency of Displaced Boiler*
Parasitic Loads	kWh	134,520	*The electricity required to operate the CHP system that would otherwise not be required by the facility/process*
Installation Cost	$	$2,565,969	*Total Installation Cost*
Maintenance $	$	$127,794	*Yearly O&M Cost to customer, excluding fuel cost required to run the CHP system*

TRC Calculator Outputs

Outputs		
Fuel Savings- S Fuel CHP	kBtu/yr	**26,537,983**
CHP efficiency (HHV)	%	**62%**
TRC		**1.36**

*All projects are to score 1 or greater utilizing the TRC calculator in order for their application to be accepted for further review. Should a project not score 1 or greater utilizing the TRC calculator, the applicant can request the designated administrator for this pilot program (ERC) to review with the applicant why the project does not score a 1 or greater. Should an individual project score slightly less than 1 on the TRC test, the DCEO has the authority to approve the project (by exception).

Evaluating Applications

- Criteria 1: Technical Completeness …….40%
- Criteria 2: Financial Completeness…… 30%
- Criteria 3: Applicant Qualifications ……..20%
- Criteria 4: Energy Efficiency of Site ……..10%

ICC Order: TRM & Energy Savings Methodology

- Suggest SAG develop CHP sub-group to:
  - Address ICC order to reach agreement on most appropriate savings calculation methodology and include in IL TRM.
  - Starting point should be the ICC approved methodology for DCEO pilot program
  - Possibly address ICC order (ComEd) to initiate discussion to evaluate a stand-alone CHP pilot program

Thank You for Your Attention

Contact Information:

John Cuttica

312/996-4382

cuttica@uic.edu

Grace Pedersen

312/996-8324

gpeders2@uic.edu